

NOTES ON AUSTRALIAN MOSQUITOES (DIPTERA, CULICIDAE). V.  
SUBGENUS PSEUDOSKUSEA IN VICTORIA.

By N. V. DOBROTORSKY, Zoology Department, University of Melbourne.\*  
(Three Text-figures.)

[Read 28th September, 1960.]

*Synopsis.*

Adults of *Aedes bancroftianus* Edwards and *Aedes multiplex* (Theobald) are redescribed and the larvae of both species are described for the first time; the pupae of these species are figured. *Aedes postspiraculosis*, n. sp., is described. An account is given of the biology and distribution of these species. *Aë. postspiraculosis* is closely related to *Aë. bancroftianus*, but can be distinguished not only by morphological traits, but also by its geographical distribution and biology. *Aë. bancroftianus* is stenogamous; *Aë. postspiraculosis* is eurygamous. The two species are sexually isolated and do not interbreed in nature where their distributions overlap. New records of the distribution of *Aedes australis* (Erichson) are reported.

The subgenus *Pseudoskusea* of the genus *Aedes* is represented in Victoria by four species. Three of these, *Aë. bancroftianus* Edwards, *Aë. postspiraculosis*, n. sp., and *Aë. multiplex* (Theobald), belong to group A—*Pseudoskusea*—which is characterized by Edwards (1932) as having: the vertex clothed with broad flat scales, no lower mesepimeral bristles, a very small eighth abdominal segment in the female, long cerci and no basal lobe on the coxite of the male terminalia. Group B—*Caenocephalus*—represented by *Aë. australis* (Erichson), is characterized by having: the vertex clothed with narrow scales only, lower mesepimeral bristles, a rather large eighth abdominal segment in the female, short cerci and a distinct basal lobe on the coxite of the male terminalia.

The species of Group A have very few traits in common with species from Group B. There is some similarity in the structure of the male terminalia, viz.: the absence of an apical lobe on the coxite and the absence of the harpago. These similarities, however, hardly justify the inclusion of the species of Group B in the subgenus *Pseudoskusea*; they should probably be placed in a separate subgenus, but this step should be deferred pending a revision of the subgenus *Pseudoskusea*.

*AÈDES BANCROFTIANUS* Edwards.

*Aedes bancroftianus* Edwards, 1921, *Bull. ent. Res.*, 12: 74.

*Distinctive Characters.* Adult: Vertex clothed with broad, flat scales, dark brownish to creamy in colour. Male palps as long as proboscis or slightly longer. Post-spiracular area with only a median patch of scales. Fore and mid claws of female toothed, hind simple. Male terminalia: Coxites without apical and basal lobes, but with dense patch of hairs at base of coxites. Style with fine preapical setae. Harpago absent. Larva: Pigmented or white (in Queensland), antennae long, dark and curved. Head seta 5, single or 2-branched; 6, single. Seta 1 of VIIIth abdominal segment usually 2-branched, rarely 3-branched. Siphonal seta 1, long, 3-branched, arising at two-thirds of length from base. Distance between base of distal spine of pecten and base of seta 1 smaller than width of siphon at level of seta 1.

*Description of Adult. Male.* Head: Vertex clothed with broad, flat, pale or brownish scales; upright forked scales in front and towards neck, pale or dark. Proboscis and palps dark-scaled. Palps as long as proboscis with labella, or slightly

\* This work was supported in part by a grant from the Trustees of the Science and Industry Endowment Fund of Commonwealth Scientific and Industrial Research Organization.

longer. Thorax: Integument dark brown. Scutum clothed with narrow scales either light brown or dark bronze in colour and becoming creamy around front margin and bare area; there may be two lines of dark scales extending from the scutellum for about half the length of the scutum. Scutellum with narrow pale-ochreous scales and 5-6 long bristles on each lobe. Anterior pronotum with elongate pale scales and bristles. Posterior pronotum with elongate dark brown scales. Post-spiracular area with only a median patch of scales and 9-12 bristles. Sternopleuron with large patch of broad scales extending from below pre-alar area along posterior edge; there are also several setae. Large patch of scales below upper mesepimeral bristles. Wing length: 3.1-4.0 mm. Knob of halteres dark. Legs dark-scaled; front and mid femora pale below; hind femora pale except apical one-third or quarter and a dorsal line which are black. Fore tarsal claws unequal (Fig. 1, *b, c, d*); anterior claw with two teeth, posterior with one; mid claws unequal, both with one tooth; hind claws equal, simple. Abdomen: Tergites dark brown with basal creamy bands which may be very narrow. Sternites black-scaled, with basal lateral patches of pale scales which may join to form basal bands. Terminalia (Fig. 1, *a*): Coxite almost cylindrical, about four times as long as width at base; sternally and laterally with black scales and strong long bristles. Basal and apical lobes absent, but coxite has small dense patch of hairs at base. Style about three-fifths length of coxite, with distal third narrower and curved inwards; terminal spine long; 3-4 long, fine, preapical spines. Harpago absent. Lobes of IXth tergite small, with 5-6 setae.

*Female.* Females differ from males as follows: Palps about one-sixth length of proboscis. Wing length 2.7-4.1 mm.  $R_2$  about twice its stem. Claws equal (Fig. 1, *e, f, g*); fore and mid claws toothed, hind claws simple. Tergites 2-4 with complete basal creamy bands, 5-6 with basal lateral creamy patches, sometimes forming basal bands. Sternites pale-scaled; apical black bands on sternites 4-6.

*Variability.* Adults from Queensland vary greatly in size and abdominal pattern. Typical females have the basal bands on the tergites well developed, but some specimens, particularly from Tarragindi, have unbanded tergites. The sternites also may be creamy scaled without apical black bands. In specimens with an unbanded abdomen the flat broad scales on the vertex are mainly dark, with only a few white scales mesially. Additional studies are required to decide the taxonomic status of the Tarragindi form.

New South Wales specimens are not as variable as those from Queensland. The posterior pronotum may have a patch of broad pale scales below; the venter is usually pale-scaled in females, but in males it may be black with lateral patches of white scales with or without basal creamy bands.

Victorian specimens are, in general, darker than those from New South Wales and Queensland, the upright scales on vertex, towards the neck, are almost black; the scutum has areas of dark almost black scales; the tergites are black-scaled with broad basal creamy bands; the venter in males may be almost black with lateral white patches, or may have scattered white scales particularly on sternite seven; in females the venter may be pale-scaled or may have an admixture of black scales; in some black scales may predominate.

The Western Australian specimens in general are similar to the Victorian specimens, but the flat wide scales on the lateral parts of the vertex are often dark, almost black, leaving only a small mesial area with pale scales. Among typical specimens there are small ones with the abdomen unbanded as in the Queensland form from Tarragindi.

*Pupa.* Details shown in Figure 1, *h, i*.

*Larva* (Fig. 1, *j, l, k*). Head and siphon pale (buff). Head as long as broad. Antennae dark, curved, spiculated, almost as long as head. Seta 1, 4-8-branched. Head seta 4, 1-3-branched; 5 and 6, single; 7, 3-5-branched; 8, single; 9, 3-branched. Mentum with central large tooth and 7-8 lateral teeth on each side. Prothoracic setae: 1, 2, 4, 5

and 6, single; 3, 2-branched; 7, 3-branched. VIIIth abdominal segment: seta 1, 2-3-branched; 2 and 4, single; 3, 4-branched; 5, 6-branched. Lateral comb patch of 70-80 fringed scales. Siphon tapering; index 4.0-4.5, mean 4.3. Pecten of 21-23 spines. Seta 1

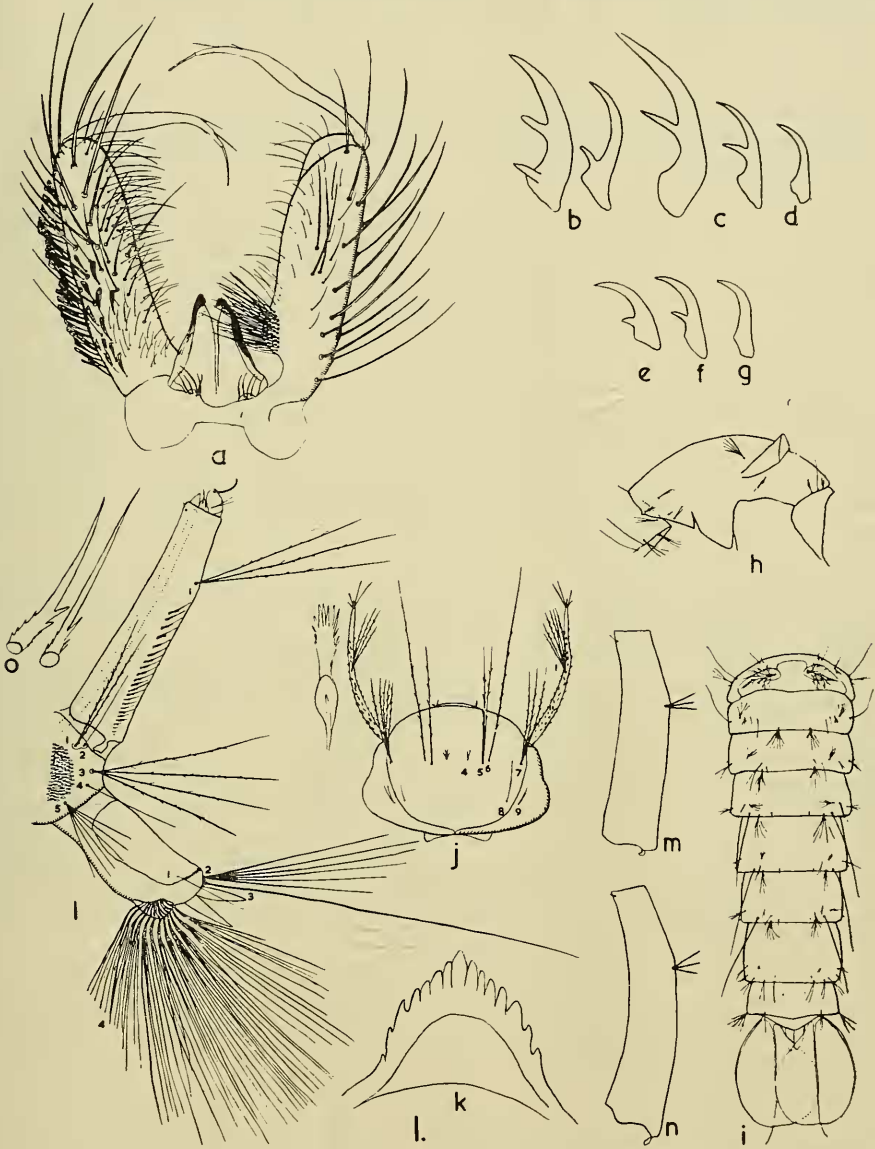


Fig. 1. *Aedes bancroftianus* Edwards. a. ♂ terminalia, left coxite sternal aspect, right tergal aspect; b-d, ♂ tarsal claws: b, fore; c, mid; d, hind; e-g, ♀ tarsal claws: e, fore; f, mid; g, hind; h-i, pupa: h, cephalothorax and metanotum; i, abdomen; j-n, larva: j, head; k, mentum; l, terminal segments; m, n, siphons of larvae from Western Australia; o, pecten spine of larva from Euroa, Vic.

arising two-thirds length along siphon, long, usually 3-branched. Distance between base of distal spine of pecten and base of seta 1 smaller than width of siphon at level of seta 1. Siphonal tracheae very narrow. Anal segment: Seta 1 and 3, single; 2, 8-9-branched; 4 (ventral brush) of 11-12 tufts. Saddle covering about three-quarters of

dorsal part of segment. Anal papillae narrow, pointed, almost equal in length and about half length of saddle.

*Variation of the Larvae.* *Aë. bancroftianus* larvae collected at Mt. Gravatt, S. Qld., have "white body, light (buff) head and siphon, long black antennae" (E. N. Marks, personal communication). However, the larvae from Western Australia and Victoria have a pigmented body (the abdomen appears banded), and on this account are distinguishable, even to the naked eye, from the larvae of *Aë. postspiraculosis*, n. sp.

Larvae from different parts of Australia show a few significant variations. Thus larvae from Queensland (6 localities) have head seta 5 always single, seta 1 of VIIIth abdominal segment, 2-branched (1 specimen with 3 branches) and siphon index of 3·7-4·5, mean 4·0.

Larvae from Victoria (1 locality) have head seta 5 always 2-branched, seta 1 of VIIIth abdominal segment 2-branched and a siphon index of 4·0-5·0, mean 4·5.

Larvae from Western Australia (2 localities) have head seta 5 single or 2-branched, seta 1 of VIIIth abdominal segment 2-3-branched and a siphon index of 3·7-4·7, mean 3·7. The siphon is usually not straight, but is more or less backwards curved (Fig. 1, *m*, *n*).

*Biology.* *Aë. bancroftianus* is eurygamous. In Victoria it has been found breeding in freshwater pools during winter-spring months in the Euroa area. This is open plain country just north of the Dividing Range, with sparsely scattered eucalypts, mainly along creeks and roads. In 1958 it was breeding in a string of pools in a natural water course with almost vertical banks. No larvae were found in these sites in 1959, but they were present in a roadside ditch 2-2½ feet deep, with grassy edges and reeds in some places; the water was cloudy.

The larvae behave like those of *Aë. theobaldi* (Taylor): most of the time they lie on their backs on the bottom of the pool, or attach themselves to the sides, or to vegetation, by means of strong hook-like setae on the spiracular valves.

In Victoria the larvae of *bancroftianus* have been found alone or in association with *Aë. alboannulatus* (Macq.) and *C. p. australicus* Dobr. and Drumm. and occasionally with *Aë. rubrithorax* Macq. and *Aë. postspiraculosis*, n. sp.

In Queensland *bancroftianus* breeds in similar habitats: Tarragindi: "Series of isolated pools in natural water course; part sun; shallow to steep bare edge, 1 foot depth; no vegetation". Mt. Gravatt: "Isolated waterhole in stagnant creek; part sun, shade from trees; slightly muddy". Terry Hie Hie (Coll. A. L. Dyce): "Cleared hillside with very few green trees remaining; a string of waterholes in a small rain water creek; water muddy". Salisbury: "Waterhole is in partly dried water course; part shade; clay edge; depth 2 feet. Water discoloured". Camp Mt.: "Casual sunlit grassy pool". (E. N. Marks, personal communication.)

The larvae of *bancroftianus* in Queensland have been found in association with: *Aë. alboannulatus*, *Aë. vittiger* Skuse, *Aë. alternans* Westw., *Aë. rubrithorax* (i.e., *procax* Marks), *Aë. milsoni* (Taylor), *A. annulipes* Walk., *C. p. australicus*, *C. pseudomelaconia* Theo., *C. douglasi* Dobr.

*Biting Habits.* *Aë. bancroftianus* is a day biting mosquito which attacks man, dog, rabbit, cow and horse.

*Distribution.* It is widely distributed in Australia, but apparently is absent from the south-east part of Victoria south of the Dividing Range. Specimens have been examined from the following localities: QUEENSLAND: Julia Creek (M. Arden), Richmond (E. N. Marks), Longreach (E. J. Reye), Clermont (J. L. Wassell), Charleville (E. J. Reye), Roma (E. R. B. Marks)—all dry inland areas. Jimna (J. L. Wassell), Camp Mt. (E. N. Marks), Brisbane Suburbs: Tarragindi, Mt. Gravatt (P. J. Sparks), Salisbury (L. Angus)—all humid coastal, comparatively high rainfall areas. Lynd Range (J. L. Wassell), Wondae; Eidsvold (Type locality, T. L. Bancroft). NEW SOUTH WALES: Uralla, Ben Lomond, Chiswick, Exmouth, Bargibal, Bindarra (E. J. Waterhouse), Terry Hie Hie (A. L. Dyce), Merricumbene (A. L. D. and R. Lewis), Corowa (G. W.

Douglas). NORTHERN TERRITORY: Palm Valley about 70 m. w. Alice Springs (K. A. Walker). WESTERN AUSTRALIA: Moora, Onslow (E. J. Britten), Kojonup, Darkan, Piawaning (D. L. McIntosh), E. Dale Bridge (J. H. Calaby). VICTORIA: Bright (K. Myers), Mildura (N. Kent), Kilmore, Euroa, Seymour, Armstrong, Grampians, Steiglitz (N. V. Dobrotworsky), Castlemaine, Serpentine, Clunes (A. Neboiss), Maryvale (G. W. Douglas), Tubbut (E. Bass).

AÈDES POSTSPIRACULOSIS, n. sp.

*Types.* The type series were bred from larvae collected at Wattle Glen, Victoria (17.9.59). The holotype male, allotype female and ten paratypes have their associated larval and pupal skins. The holotype male, allotype female, six paratype males and six paratype females are in the collections of the National Museum, Melbourne. One paratype male and one paratype female are in each of the following collections: C.S.I.R.O., Division of Entomology, Canberra; School of Public Health and Tropical Medicine, Sydney, University of Queensland, Brisbane; British Museum (Natural History), London; U.S. National Museum, Washington.

*Distinctive Characters.* Vertex clothed with broad, flat scales pale mesially and dark laterally. Male palps shorter than proboscis with labella. Post-spiracular area with patch of scales medially and a second elongate patch on lower part between sub-spiracular area and sternopleuron. In female all claws simple. Male terminalia: Coxites without apical or basal lobe, but with dense long fine hairs at base of coxites. Style with thick preapical setae. Harpago absent. Larva: Milky-white. Head seta 5, single. Seta 1 of VIIIth abdominal segment 3-branched, rarely 4-branched. Siphonal seta 1, long, 3-5-branched, arising at two-thirds of length from base. Distance between base of distal pecten spine and seta 1 greater than width of siphon at level of seta 1.

*Holotype Male.* Head: Vertex clothed with broad, flat scales, pale mesially and darker laterally. Upright forked pale scales only towards neck. Proboscis and palps black-scaled. Palps slightly shorter than proboscis with labella. Thorax: Integument black. Scutum clothed with narrow brownish and yellowish-golden scales which become paler and broader around bare area. Scutellum with narrow pale scales and 10-11 long dark bristles on each lobe. Anterior pronotum with elongate pale scales and bristles. Posterior pronotum clothed with narrow and elongate brown scales, which become broader and paler below. Post-spiracular area with patch of scales and bristled medially and a second elongate patch on lower part between sub-spiracular area and sternopleuron. Sternopleuron with large patch of broad scales below pre-alar area and extending along posterior edge of sternopleuron; there are also several setae, two of them long and strong. Mesepimeron with large patch of scales below upper mesepimeral bristles; lower mesepimeral bristles absent. Wing length 4.0 mm. Wings dark-scaled with a few white scales at base of costa. Knob of halteres pale-scaled. Legs: Dark-scaled; front and mid femora pale below; hind femora pale except tip and dark line dorsally. Fore tarsal claws unequal (Fig. 2, *b, c, d*); anterior claw with two teeth, posterior with one; mid claws unequal, both with one tooth; hind claws equal, simple. Abdomen: Tergites black-scaled, second with narrow creamy basal band, 3-6 with broad basal bands. Sternite 1 pale-scaled, 2-6 creamy basally, black apically and with some black scales medially on sternites 2-3. Terminalia (Fig. 2, *a*): Coxites almost cylindrical, with black scales and strong long black bristles sternally and laterally. Basal and apical lobes absent, but coxite has dense patch of fine long hairs at base. Style about three-fifths length of coxite, narrow, curved inwards on apical third, with 3-4 preapical spines at least two of which are almost as thick as appendage; appendage long, slender and almost straight. Paraproct with single tooth. Harpago absent. Lobes of IXth tergite small with 5-6 seta.

*Paratype Males.* The series of 10 paratype males does not show much variation. Palpi may be as long as proboscis without labella or slightly shorter. Scutal scales may be light brown except on fossa where they are dark brown. Wing length 3.7-4.0 mm. Black apical bands on sternites may extend mesially, forming a triangular black patch.

*Allotype Female.* This differs from the holotype as follows: Head: Upright forked scales are in front along eye margin and more numerous towards neck. Palps about one-sixth length of proboscis. Thorax: Scutal scales mostly dark brown, becoming pale around front margin and bare area; two small pale patches in front of bare area. Scutellum with 9-10 long bristles on each lobe. Wing length: 4.3 mm.;  $R_2$  twice as long

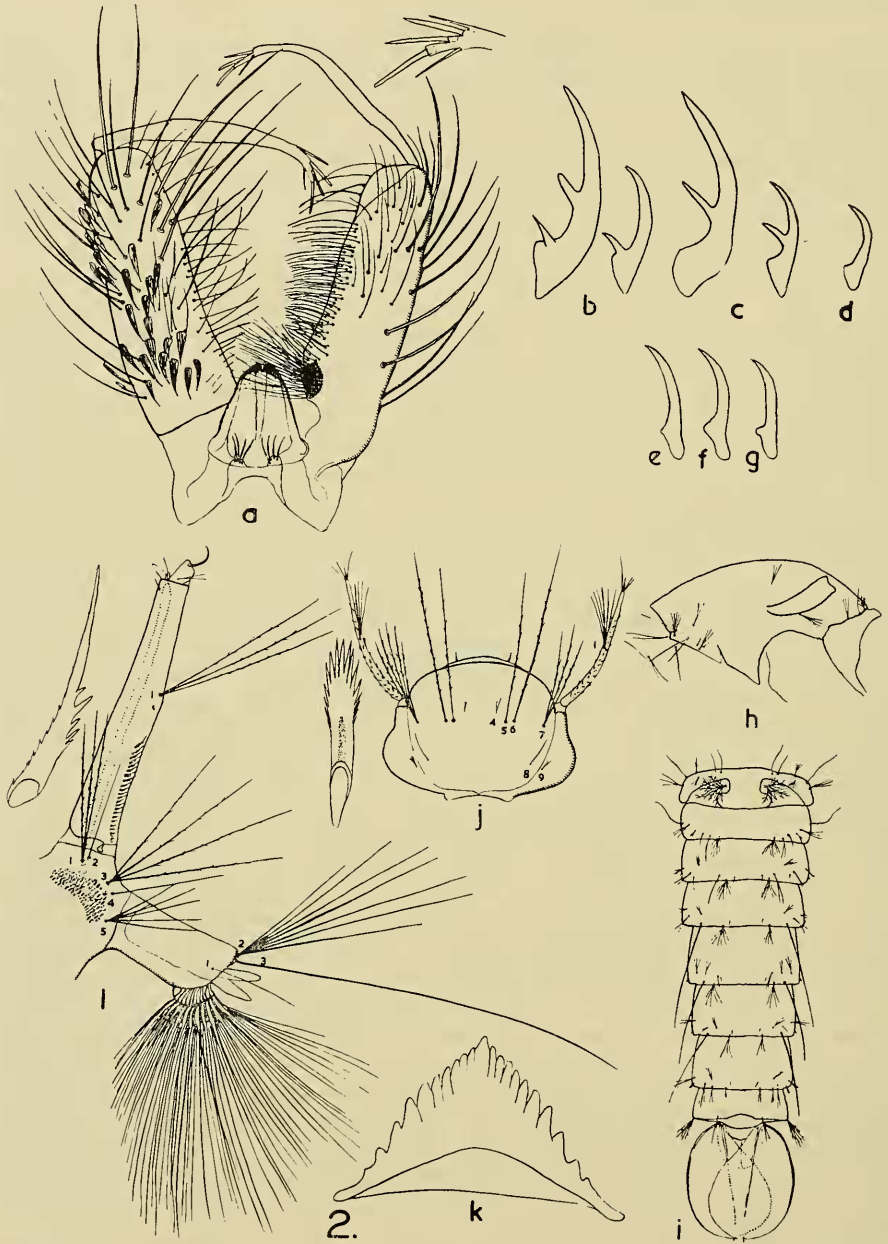


Fig. 2. *Aedes postspiraculosus*. n. sp. a, ♂ terminalia, left coxite sternal aspect, right tergal aspect; b-d, ♂ tarsal claws: b, fore; c, mid; d, hind; e-g, ♀ tarsal claws: e, fore; f, mid; g, hind; h-i, pupa: h, cephalothorax and metanotum; i, abdomen; j-l, larva: j, head; k, mentum; l, terminal segments.

as its stem. All claws equal, simple (Fig. 2, *e, f, g*). Tergite 7, black. Sternites creamy-scaled with some admixture of black scales on segment 6; segment 7, black-scaled.

*Paratype Females.* The series of 10 paratype females does not show significant variations. Wing length: 4.0-4.3 mm.;  $R_2$ , 1.7-2.2 as long as its stem.

*Pupa.* Details shown in Figure 2, *h, i*.

*Larva* (Fig. 2, *j, l, k*). Milky white; head and siphon light brown, siphon becoming darker towards tip. Head: Antennae dark, thin, curved, spiculated, almost as long as head; seta 1, 4-7-branched. Head setae: 4, 2-4-branched; 5, 6 and 8, single; 5, single, rarely 2-branched on one side; 7, 4-5-branched (may be 3-branched on one side); 9, 2-5-branched. Mentum with long central tooth and 9-11 strong lateral ones on each side. Prothoracic setae: 1, 2, 3, 4, 5 and 6, single; 7, 3-4-branched. VIIIth abdominal segment: Seta 1, 3-4-branched; 2 and 4, single; 3, 4-5-branched; 5, 4-7-branched. Lateral comb patch of 60-70 fringed scales. Siphon tapering, with index 4.7-5.3, mean 5.0; pecten of 20-30 spines. Seta 1 arising two-thirds along siphon, long, usually 3-branched, may be 4-5-branched. Distance between base of distal pecten spine and seta 1 greater than width of siphon at level of seta 1. Siphonal tracheae very narrow. Anal segment: Seta 1 and 3, single; 2, 5-8-branched; 4 (ventral branch), of 11-12 tufts. Saddle covering three-quarters of dorsal part of segment. Anal papillae narrow, almost equal in length, about half length of saddle.

*Biology.* *Aë. postspiraculosis* is stenogamous. It is confined to wooded undulating country. Natural water courses which run only after heavy rains and retain water in holes for long periods provide the main breeding sites for this species. Water in such pools is usually cloudy. The pools may or may not have vegetation, but the banks are usually grassy; the depth varies from 1 to 2½ feet. The pools are usually shaded for part of the day and the water temperature remains below 20°C. even during the summer. The larvae behave like those of *Aë. bancroftianus* lying on their backs on the bottom for most of the time or attaching themselves to vegetation.

The number of generations depends on rainfall; in drier areas or during very dry summers there would be only spring and autumn generations, but in higher rainfall areas or during wet summers there may be two or more additional summer generations.

Mating occurs during the day. The males form small swarms of a dozen or two near the breeding sites; they move about close to the observer and near the ground, in "searching flights", and as females approach the observer, the males attack them. Coupling occurs in flight and is usually completed on the grass.

In the laboratory mating will take place in cages of 1 cubic foot capacity, if the mosquitoes have been induced to fly by shaking the cage or by just blowing into it. As soon as the females are in flight the males attack them and coupling can be observed.

The larvae have been found in association with *Aë. rubrithorax (queenslandis)* (Strickl.), *Aë. alboannulatus*, *Aë. waterhousei* Dobr., *Th. inconspicua* Lee, *C. p. australicus* and occasionally with *Aë. bancroftianus*.

*Biting Habits.* It is a day biting mosquito which attacks man; it usually prefers to settle on clothing rather than on bare skin.

*Distribution.* *Aë. postspiraculosis* is distributed widely on and south of the Dividing Range in Victoria and is also recorded from New South Wales and South Australia. Specimens have been examined from the following localities: NEW SOUTH WALES: Exmouth, Uralla (E. J. Waterhouse). VICTORIA: Lyonville, Ballan, Grampians, Kilmore, Steiglitz, Ringwood, Wattle Glen, Panton Hill, Hurstbridge, Eltham, Christmas Hills, Baxter (N. V. Dobrotworsky). SOUTH AUSTRALIA: Mt. Torrens (E. W. Lines).

#### *Reproductive Isolation of Aë. bancroftianus and Aë. postspiraculosis.*

Reproductive isolation of the two species was demonstrated by mating experiments.

Adults of *Aë. bancroftianus* were reared from larvae collected at Euroa, adults of *Aë. postspiraculosis* from larvae collected at Wattle Glen. In both groups the pupae

were segregated according to sex. All mating experiments were carried out at room temperature; the mosquitoes used were at least four days old. Successful mating was determined by examination of the spermathecae.

*Aë. bancroftianus* did not mate in cages of 6 cubic feet capacity even if there were 4-6 times as many males as females. In one experiment, for example, 11 females were caged with 45 males for 6 days; in another, 25 females were caged with 65 males for 14 days. Not a single female was fertilized in either experiment.

It was observed that the males remain inactive during the day and evening flying, only to feed on sugar solution. When disturbed they soon settled without making any attempts to copulate with females.

*Aë. postspiraculosus*, which mates readily in small cages, behaves quite differently. Males are very active; they often remain in flight for long periods and attack any flying females.

Preferential mating experiments (Table I) demonstrate that *postspiraculosus* males show complete preference for females of their own species and did not mate with *bancroftianus* females even when no choice was given.

TABLE I.  
*Preferential Mating of the Males of Aë. postspiraculosus with Females of Aë. bancroftianus and Aë. postspiraculosus.*

Males.	Number of		Fertilized.		Size of Cage.
	Females.		<i>bancroftianus</i> .	<i>postspiraculosus</i> .	
	<i>bancroftianus</i> .	<i>postspiraculosus</i> .			
10	25	25	0	11	1 cub. foot
20	20	20	0	14	1 cub. foot
20	20	—	0	—	6 cub. feet

In one locality in Victoria (Steiglitz) both species have been breeding in large numbers in the same pool. Examination of the larvae and the adults from this locality revealed no intermediates; apparently the two species are reproductively isolated in nature and therefore *Aë. postspiraculosus* can be regarded as a good species.

*Aë. postspiraculosus* is the most recent species, which may be derived from *Aë. bancroftianus*. It apparently arose on the edge of the distribution of *Aë. bancroftianus* somewhere on the Dividing Range and then spread to the south-eastern cooler part of Australia.

#### AËDES MULTIPLEX (Theobald).

*Skusea multiplex*, Theobald, 1903, *Mon. Cul.*, III: 293-294. *Pseudoskusea multiplex*, Theobald, 1907, *Mon. Cul.*, IV: 192-193. *Aëdes multiplex*, Edwards, 1924, *Bull. ent. Res.*, 14: 386.

*Distinctive Characters.* Adult: Vertex clothed with broad, flat scales. Males: Palps as long as proboscis. Thorax clothed with narrow bronzy-black scales, with transverse band of ochreous scales across middle of scutum. Sub-spiracular and post-spiracular areas devoid of scales. Male terminalia: Coxites without apical and basal lobes, but with patch of hairs at base. Harpago absent. Larva: Head seta 5 and 6, 2-branched; seta 1 of VIIIth abdominal segment 6-7-branched. Seta 1 arising slightly beyond mid length of siphon, small, 2-3-branched.

*Description of Adult. Male.* Head: Narrow curved golden scales round eye margin. Vertex clothed with broad, flat, dark scales, sometimes pale. Proboscis and palps dark-scaled. Palps about as long as proboscis with labella. Thorax: Integument dark brown. Scutum clothed with narrow curved bronzy-black scales, with transverse band of ochreous scales across middle of scutum; this band may be broken into two lateral patches. Scutellum with narrow pale scales and 4-5 long bristles on each lobe. Anterior



pronotum with dark bristles only. Posterior pronotum with a few narrow bronze scales. Post-spiracular area with bristles only. Sternopleuron with large patch of broad white scales below prealar area and a second patch along posterior edge; the

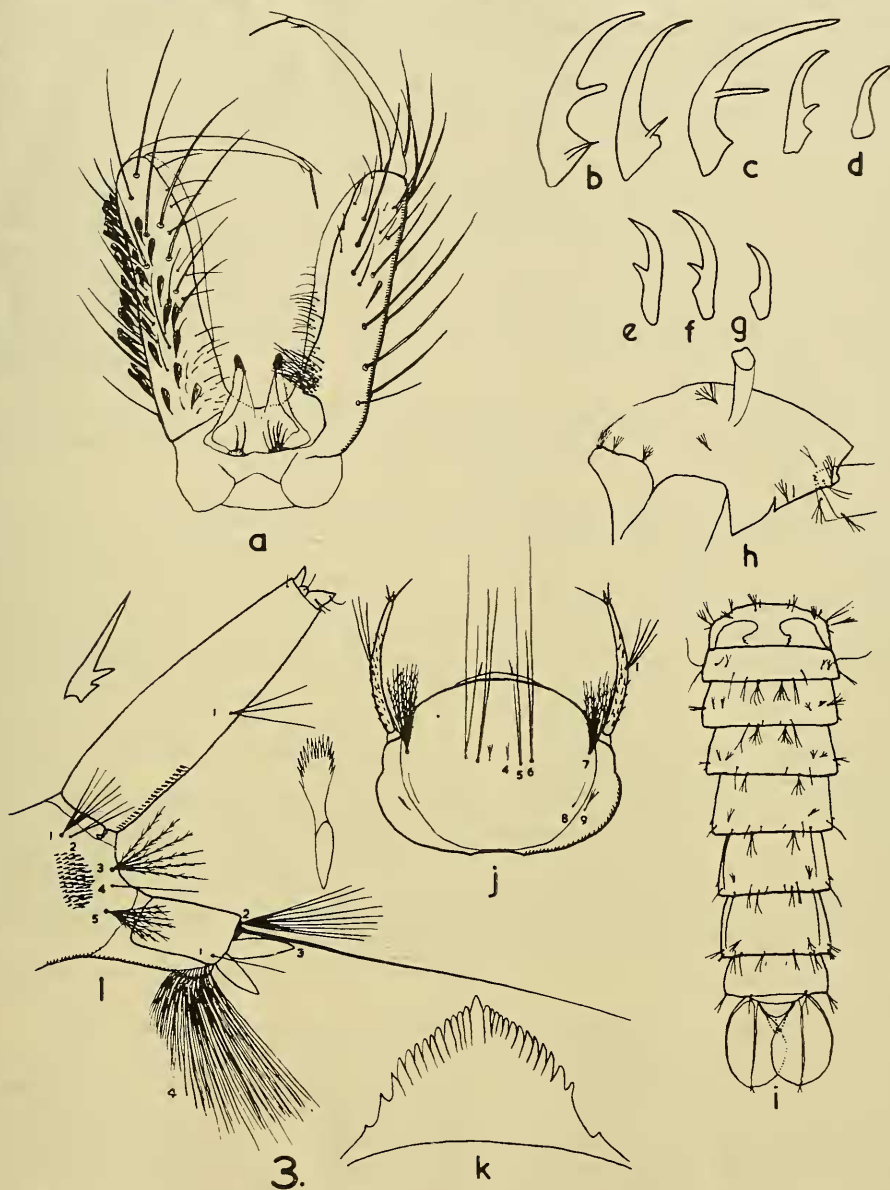


Fig. 3. *Aedes multiplex* (Theobald). a, ♂ terminalia, left coxite sternal aspect, right tergal aspect; b-d, ♂ tarsal claws: b, fore; c, mid; d, hind; e-g, ♀ tarsal claws: e, fore; f, mid; g, hind; h-i, pupa: h, cephalothorax and metanotum; i, abdomen; j-l, larva: j, head; k, mentum; l, terminal segments.

two patches may join. Towards posterior edge of sternopleuron there are two strong bristles and several weaker ones. Large patch of scales below upper mesepimeral bristles; no lower bristles. Wing length about 3 mm. Knot of halteres dark-scaled. Legs black, unbanded; fore and mid femora pale below, hind femora pale on basal half,

dark on apical half and with dark line dorsally. Fore tarsal claws unequal (Fig. 3, *b, c, d*); anterior claw with two teeth, posterior with one; mid claws unequal, both with one tooth; hind claws equal, simple.\* Abdomen: Tergites black-scaled with narrow basal white bands on segments 2-7. Sternites white-scaled with apical black bands. Terminalia (Fig. 3, *a*): Coxite almost cylindrical, four times as long as their width at base, sternally and laterally with black scales and strong and weak bristles. Basal and apical lobe absent, but coxite with small patch of moderately long fine hairs at base. Style about three-fifths length of coxite, almost straight, narrowing apically with 3 fine spines; appendage long. Lobes of IXth tergite with 2-6 setae.

*Female.* Females differ from the males as follows: Flat, broad scales on vertex may be black except for some ochreous-white scales mesially. A few black forked upright scales in front of vertex and towards neck. Palps about one-sixth length of proboscis. Wing length: 2.9-3.6 mm.,  $R_2$  little less than twice its stem. Hind femora pale on basal two-thirds; apical third and dorsal line black. Claws equal (Fig. 3, *e, f, g*); fore and mid claws toothed, hind claws simple. Tergites with lateral basal patches of white scales; in addition there may be a median patch of white scales at base of segments 2 and 6, and narrow basal bands on segments 3-5. Sternites black-scaled with white basal bands.

*Larva* (Fig. 3, *j, l, k*). Head and siphon brownish, body whitish. Head about three-quarters as long as broad. Antennae about four-fifths length of head; seta 1, 3-branched. Head setae: 4, 3-6-branched; 5 and 6, 2-branched; 7, 8-12-branched; 8, single; 9, 4-5-branched. Seta 6 of 2 unequal branches, inner branch much thinner and about three-quarters length of outer one. Mentum with longer central tooth and 11-12 lateral teeth on each side. Prothoracic setae: 1, 2, 3, 5 and 6, single; 3, may be 2-branched; 4, 2-branched; 7, 3-branched. VIIIth abdominal segment: Seta 1, 6-7-branched; 2, 2-branched or single; 3, 6-7-branched; 4, single; 5, 6-7-branched. Lateral comb patch of about 60 fringed scales. Siphon almost cylindrical, slightly tapering apically; index 4.1-4.6, mean 4.4. Pecten of 18-24 spines; spines small with 1 or 2 teeth at base. Seta 1 arising slightly behind mid length of siphon, 2-3-branched, small. Anal segment: Seta 1 and 3 single; 2, 7-8-branched; 4 (ventral brush), of 11-12 tufts. Saddle covering about three-quarters dorsal part of segment. Anal papillae unequal, upper pair about half length of saddle.

*Biology.* *Aë. multiplex* is common only at Cabbage Tree Creek (East Gippsland) in Victoria. Larvae had not been collected in the field in Victoria. In Queensland they have been found in fairly shaded ground pools (e.g., at Tewartin) "in drying-out tea-tree swamps close to mangroves, water was fresh, discoloured, peaty soil, some dried grass or sedge". At Woombye larvae have been found alone in a shallow well with earth walls and covered with wooden clubs (E. N. Marks).

The larvae of *multiplex* have been found in association with *A. funereus* and *C. annulirostris*.

*Biting Habits.* *Aë. multiplex* is a day biting mosquito which attacks man.

*Distribution.* *Aë. multiplex* is a coastal species which is distributed from Queensland to East Gippsland, Victoria. Specimens have been examined from the following localities: QUEENSLAND: Tewartin (E. N. Marks), Maroochydore (Perkins and Wassell), Maooloolaha (E. N. Marks), Woombye, Endlo Creek, Forest Glen, Buderim (J. L. Wassell), Mountain Creek (Buderim), Myora, Dunwich (E. N. Marks): the last two localities are on Stradbroke I. NEW SOUTH WALES: Williamstown (K. J. Clinton). VICTORIA: Cabbage Tree Creek, Kalimna (N. V. Dobrotworsky).

#### AËDES AUSTRALIS (Erichson).

*Culex australis* Erichson, 1842, *Arch. Naturgesch.*, 8: 270. *Culex crucians* Walker, 1856, *Ins. Saund. Dipt.*, 1: 432. *Culicada tasmaniensis* Strickland, 1911, *Entomologist*, 44: 181. *Caenocephalus concolor* Taylor, 1914, *Trans. ent. Soc. Lond.*, 46: 700. *Aëdes*

\* In Theobald's (1907) description of the male it is stated that both fore claws have one tooth; apparently the small basal tooth was not noticed.

*concolor*, Edwards, 1924, *Bull. ent. Res.*, 14: 387. *Aedes australis*, Mattingly and Marks, 1955, *Proc. Linn. Soc. N.S.W.*, 80: 163-166.

*Aedes australis* is a saltwater breeder and is one of the few mosquitoes which combine stenogamy with autogeny. Because of this it can be easily colonized in the laboratory and it has been closely studied by Woodhill (1936), Woodhill and Pasfield (1941) and more recently by O'Gower (1958). The taxonomic position of this species has only recently been clarified by Mattingly and Marks (1955).

To avoid unnecessary repetition of the description of this species only its distinctive characters and new records are given.

*Distinctive Characters.* Adult: Vertex with narrow curved golden scales. Palps shorter than proboscis without labella; last segment swollen. Post-spiracular area with large patch of broad black scales medially and a few pale scales below it. All female claws equal, toothed. Male terminalia: Apical lobe of coxite absent; basal lobe prominent with numerous setae. Harpago absent. Larva: Antennae and siphon short. Head seta 5, single; 6, 2-branched. Seta 1 of VIIIth segment 3-6-branched. Siphon index about 2; seta 1 moderately long, 7-8-branched, arising about mid-length of siphon. Anal papillae absent.

*Distribution.* Specimens have been examined from the following localities: VICTORIA: Wilson's Promontory, Phillip Island, Williamstown (N. V. Dobrotworsky). TASMANIA: Randall's Bay, Bichem (J. G. Anderson).

#### *Acknowledgements.*

The author is grateful to Dr. F. H. Drummond for assistance in preparation of the manuscript. He is particularly indebted to Dr. E. N. Marks, University of Queensland, for helpful discussion, co-operation and for providing specimens from University Collections, to Mr. E. J. Waterhouse and D. L. McIntosh, Wildlife Survey Section, C.S.I.R.O., for providing specimens, and to Mr. D. J. Lee, School of Public Health and Tropical Medicine, University of Sydney, for the loan of topotypical material of *Aë. bancroftianus*.

#### *References.*

- EDWARDS, F. W., 1932.—*Genera Insectorum*. Fasc. 194 (Diptera, Culicidae). Brussels.  
 MATTINGLY, P. F., and MARKS, E. N., 1955.—Some Australian Mosquitoes (Diptera, Culicidae) of the subgenera *Pseudoskusea* and *Neoculex*. *Proc. Linn. Soc. N.S.W.*, 80: 163-176.  
 O'GOWER, A. K., 1958.—The oviposition behaviour of *Aedes australis* (Erickson) (Diptera, Culicidae). *Proc. Linn. Soc. N.S.W.*, 83: 245-250.  
 WOODHILL, A. R., 1936.—Observations and experiments on *Aë. concolor* Taylor. *Bull. Ent. Res.*, 27: 633-648.  
 WOODHILL, A. R., and PASFIELD, G., 1941.—An illustrated key to some common Australian culicine mosquito larvae, with notes on the morphology and breeding places. *Proc. Linn. Soc. N.S.W.*, 66: 201-214.